DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO

OPNAVINST 4790.16
N43
6 May 1998

OPNAV INSTRUCTION 4790.16

From: Chief of Naval Operations

Subj: CONDITION-BASED MAINTENANCE (CBM) POLICY

Ref: (a) OPNAVINST 4780.6C (Procedures for Administering Service Craft and Boats in the U.S. Navy)
(b) OPNAVINST 4700.7J (Maintenance Policy for Naval Ships)
(c) NAVAIRINST 4790.20 (Reliability-Centered Maintenance Program)
(d) SECNAVINST 5400.15A (Department of the Navy Research, Development and Acquisition, and Associated Life Cycle Management Responsibilities)

Encl: (1) CBM Definitions

1. Purpose. To establish policy and responsibility for the implementation and integration of Condition-Based Maintenance (CBM) for naval ship, submarine, aircraft systems, equipment and infrastructure.

2. Scope. This instruction applies to all naval ships, aircraft and infrastructure (active and reserve), except civilian-operated ships assigned to the Military Sealift Command. Throughout this instruction, the term "ship" refers to all surface ships, aircraft carriers, submarines, and those patrol and service craft specified in reference (a). The purpose of the CBM strategy is to perform maintenance only when there is objective evidence of need, while ensuring safety, equipment reliability, and reduction of total ownership cost. The fundamental goal of CBM is to optimize readiness while reducing maintenance and manning requirements.

3. Background

a. Maintenance comprises a major portion of total ownership costs for Navy weapons systems. Unnecessary maintenance contributes to inflated ownership costs and reduced readiness for deployable assets. Proper application of CBM practices, as part

of an overall maintenance effort, can reduce operating and support (O&S) costs, and manpower requirements by providing a basis for maintenance decisions that focus limited resources on that maintenance most needed to ensure safety and mission readiness. In doing so, it provides a means to manage the risk of mission degrading failures.

b. At the core of Navy maintenance, Reliability-Centered Maintenance (RCM) defined in references (b) and (c), provides the principles and the rigorous methodology needed to select the appropriate type of maintenance. Recent advances in technologies, [such as advanced signal processing techniques (e.g., neural networks and fuzzy logic), high-speed image processing, dynamic modeling and simulation, micro-electromechanical systems (MEMS), wireless data communications and health monitoring systems] are expected to provide significant improvements in safety, reliability and affordability. When implemented effectively, these and other CBM enabling technologies can reduce maintenance and manning requirements. Enclosure (1) provides definitions of key terms associated with CBM.

4. Policy. CBM methodology shall be used to determine maintenance decisions and reduce scheduled maintenance and manpower requirements, while reducing O&S costs and ensuring the appropriate maintenance is performed. The transition to CBM involves changes in policy, processes, procedures and logistics support. To this end, maintenance programs shall incorporate CBM practices to the maximum possible extent. Specifically:

a. All RCM methods shall continue to be used to determine the evidence to select the appropriate type of maintenance for Navy equipment and systems. RCM shall also be used to extend periodicity or eliminate unnecessary scheduled maintenance requirements based on operating experience, as applicable.

b. CBM policy shall be incorporated into existing maintenance programs and into the Integrated Logistics Support (ILS) program elements for systems and equipment under acquisition.

c. Since rapid system demonstration and testing is desired to implement CBM technologies and since commercial off-the-shelf (COTS) items are typically more cost effective, maximum use shall be made of existing COTS items. Initial logistics support need only be sufficient to ensure valid testing and proof-of-concept. Prior to comprehensive and repetitive installations of CBM-supported systems or equipment, complete logistics support is required.

d. It is essential that full CBM implementation include training for maintenance managers, technicians afloat, and technical support personnel ashore. All new and unique training requirements (including embedded and onboard capabilities) as well as the impact of the introduction of new training technology shall be identified in training plan documentation.

e. CBM enabling technologies shall comply with Defense Information Infrastructure (DII) initiatives and related standards concerning interoperability and openness.

(1) CBM enabling information systems (data collection and information analysis) shall be integrated with maintenance management and logistics support information systems. The impact of information systems data collection, processing, and warehousing requirements on afloat and ashore resources shall be considered in system design, development and life-cycle planning.

(2) Under the principles of open systems architecture, acquisition managers shall fully consider the advantage of common interface standards for afloat and ashore information systems.

f. Chief of Naval Operations (CNO) will fund naval programs, processes and enabling technologies proven applicable and effective in supporting the maintenance, manning and cost reduction objectives of this instruction.

g. CNO will develop and prioritize a Navy CBM investment funding strategy predicated upon advice from Deputy CNO (Logistics) (N4), OPNAV resource sponsors, Fleet Commanders in Chief (FLTCINCs), Systems Commands (SYSCOMs) and Program Executive Offices (PEOs).

5. Responsibilities

a. Director Supportability, & Modernization Division (N43)

(1) Provide Navy policy for the development of CBM.

(2) Develop and maintain the long range strategy for CBM development and provide direction to focus CBM implementation efforts.

(3) Act as funding advocate and assessor for CBM implementation to ensure resources most effectively support CBM processes, procedures and enabling technologies with broad applications across platforms and SYSCOMs.

b. CNO (N6, N42, N85, N86, N87, N88)

(1) Establish requirements and specific platform guidance for the development, test and evaluation, and implementation of CBM.

(2) Evaluate the installation and testing results of CBM technologies, with the goal of further refinement and follow-on installation of those items with the greatest potential for cost and manpower savings.

(3) Provide resource sponsorship for the installation of approved CBM enabling technologies in cognizant platforms, systems and equipment, as well as CBM enabling processes and procedures.

(4) Identify and promote the application of appropriate common CBM processes, procedures and technologies across applicable naval platforms.

c. CNO (N091)

(1) Identify Science and Technology (S&T) requirements for advancing CBM enabling technologies in close coordination with CNO, PEOs, SYSCOMs and FLTCINCs through the Round Table Process.

(2) Work with the Office of Naval Research (ONR) to:

(a) Plan, develop and coordinate the transitioning of technologies responding to CBM S&T requirements.

(b) Coordinate with all SYSCOMs and PEOs the demonstration and rapid transition of requirements-driven CBM enabling technologies in weapons systems and platforms.

(3) As the S&T resource sponsor, conduct periodic assessments of ONR's CBM Science and Technology program with respect to requirements.

d. Commander, Naval Sea Systems Command

(1) Support CNO and PEOs in the testing and assessment of CBM processes, procedures and enabling technologies.

(2) Provide support for development and application of CBM processes, procedures and technologies.

(3) Support integration of CBM technologies into other modernization and engineering development efforts.

(4) Provide procedures and training for the implementation of CBM, with the goal of reducing maintenance costs and extending periodicities or eliminating unnecessary scheduled maintenance requirements for applicable systems and equipment.

(5) Review and coordinate platform specific CBM initiatives that would reduce maintenance and manning requirements, personnel workload and life cycle costs.

(6) Support CBM implementation on cognizant platforms and promote application of proven CBM processes, procedures and enabling technologies across all applicable platforms to CNO, PEOs, FLTCINCs and other SYSCOMs.

e. Commander, Naval Air Systems Command

(1) Provide engineering support to CNO and PEOs in the testing and assessment of CBM processes, procedures and enabling technologies.

(2) Provide engineering support for the development and application of CBM processes, procedures and enabling technologies.

(3) Support the integration of CBM technologies into modernization and engineering development efforts.

(4) Provide procedures and training for the implementation of CBM, with the goal of reducing maintenance costs, extending periodicities or eliminating unnecessary scheduled maintenance requirements for applicable systems and equipment.

(5) Review and coordinate platform-specific CBM initiatives that would reduce maintenance and manning requirements, personnel workload life cycle costs.

(6) Provide engineering support for CBM implementation on cognizant platforms and promote application of proven CBM technologies across all applicable platforms to CNO, PEOs, FLTCINCs and other SYSCOMs.

f. Commander, Space and Naval Warfare Systems Command

(1) Support implementation of CBM processes, procedures and enabling technologies for applicable equipment and systems.

(2) Provide technical support for installation, compatibility and interface of shipboard information management systems and CBM automated health monitoring systems. Promote compliance with NII initiatives and standards for shipboard information, local area network (LAN), and CBM enabling technologies.

(3) Support the integration of CBM information technologies into other applicable modernization and engineering development efforts.

(4) Provide procedures and training for the implementation of CBM, with the goal of reducing maintenance costs, extending periodicities or eliminating unnecessary scheduled maintenance requirements for applicable systems and equipment.

(5) Promote the application and implementation of proven CBM technologies across all applicable platforms to CNO, PEOs, FLTCINCs, and other SYSCOMs.

g. PEOs

(1) Act for and exercise the authority of the Assistant Secretary of the Navy (Research, Development and Acquisition) (ASN(RD&A)) to manage assigned programs and related technical support in accordance with provisions of reference (d).

(2) Support cognizant program offices through coordination and promotion of common CBM technologies and processes with multi-platform applications.

(3) Provide recommendations for further development or improvement of CBM equipment and systems installed for testing and evaluation.

(4) Promote full scale implementation of appropriate CBM technologies on existing and new construction platforms.

h. Director, Naval Nuclear Propulsion Program (N00N/SEA 08)

(1) As outlined in OPNAVINST 5430.48 (series), Office of CNO Organizational Manual, Executive Order 12344 (statutorily prescribed by P.L. 98-525, Title 42, United States Code, Section 7158) established the responsibilities and authorities of the Director, Naval Nuclear Propulsion, CNO (N00N) who also serves as the Deputy Commander, Naval Sea Systems Command (SEA 08), and as Deputy Assistant Secretary for Naval Reactors, U.S. Department of Energy, over all facilities and activities which comprise the Naval Nuclear Propulsion Program. These responsibilities and authorities include all matters pertaining to maintenance, repair, and modification of naval nuclear propulsion plants and associated nuclear capable facilities. Nothing in this instruction supercedes or changes these responsibilities and authorities. Accordingly, the Director, Naval Nuclear Propulsion shall determine policies and practices pertaining to implementation of this instruction for matters under his cognizance.

i. FLTCINCs

(1) Identify and promote the implementation of proven CBM processes, procedures and enabling technologies to cognizant SYSCOMs.

(2) Provide operational assessment of CBM effectiveness to CNO (N4), recommending changes to CBM implementation plans and policy.

(3) Coordinate platform availability for the development and demonstration of emerging CBM technologies.

j. Deputy CNO (Manpower and Personnel) (N1)

(1) Coordinate the implementation of innovative manpower reduction initiatives (e.g., Reduced Ship's Crew by Virtual Presence (RSVP)) resulting from the implementation of CBM policies, processes and procedures, and the installation of CBM enabling technologies.

(2) Advise CNO (N43) of potential manpower impact associated with advances in CBM policies, procedures, and enabling technologies.

(3) Develop and issue manpower documents reflecting changes in manpower requirements resulting from installation of CBM-enabling technologies and from maintenance workload reductions resulting from other CBM related initiatives.

k. Director of Naval Training (N7)

(1) Coordinate the implementation of innovative instructional approaches (e.g., just-in-time training) for initial, replacement and refresher training in support of CBM policies, processes, procedures and enabling technologies.

(2) Review and advise CNO (N43) of any training issues or initiatives that support CBM.

6. Action. Wide dissemination of this instruction is directed to ensure all concerned are thoroughly acquainted with and adhere to revised FMP policies.

W. J. HANCOCK
Deputy Chief of Naval
Operations (Logistics)

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CBM DEFINITIONS

1. Condition-Based Maintenance (CBM). A methodology that stipulates the performance of maintenance only when there is objective evidence of need.

2. Commercial Off-The-Shelf (COTS). Existing or previously developed commercial or military items. The use of COTS saves research and development costs, shortens fielding time and reduces the risk associated with new development.

3. Corrective Maintenance. Tasks that correct unsatisfactory conditions, restore lost functionality following a functional failure or restore failure resistance.

4. Diagnostics. A maintenance tool that may use an automated system to collect, compile, analyze and manipulate sensor information to perform fault detection/fault severity estimation.

5. Information Systems. Computing systems designed to collect, compile, maintain and distribute sensor information required for CBM implementation and practices.

6. Prognostics. A maintenance tool that may use an automated system to identify causes of expected failure and calculate remaining life/time-to-failure of equipment.

7. Preventive/Scheduled Maintenance. Maintenance tasks that minimize the probability and severity of lost or degraded functions (e.g., timed-directed, condition-directed, failure-finding, servicing and lubrication tasks), and that are scheduled on a recurring basis related to calendar time, equipment age or operating time.

8. Reliability-Centered Maintenance (RCM). A method which identifies applicable and effective maintenance tasks needed to maintain the inherent reliability of systems or equipment at minimum cost. RCM provides rules for determining appropriate objective evidence of need.